Laser-marking laminated structure and laser-marked laminated structure

Patent Number: EP0771677

Publication date: 1997-05-07

Inventor(s): OZAWA ATSUYA (JP); HAYASHI KAZUYOSHI (JP); SHIMIZU KOJI (JP); SHIMOYAMADA MASAHIRO (JP)

Applicant(s):: DAINIPPON PRINTING CO LTD (JP)

Requested Patent: JP9123606

Application Number: EP19960117634 19961104

Priority Number (s): JP19950309880 19951102

IPC Classification: B44B7/00 ; B41M5/24 ; B23K26/00

EC Classification: B23K26/18, B41M5/24, B44B7/00G

Equivalents:

Abstract

A laser-marking laminated structure has at least a base layer (2), a masking layer (3) capable of being removed by irradiation with a laser beam, and an OP layer (4) formed in that order on a support element (1). The base layer and the masking layer are colored layers having colors distinctly different from each other in lightness. The laser-marking laminated structure is irradiated with a laser beam in a desired pattern including characters to remove portions of the masking layer (3) and the OP layer (4) corresponding to the pattern so that the pattern is displayed clearly on the laser-marking laminated structure because of the contrast between the color of the base layer (2) and that of the masking layer (4).

書誌

(19)【発行国】日本国特許庁(JP)
(12)【公報種別】公開特許公報(A)
(11)【公開番号】特開平9－123606
(43)【公開日】平成9年(1997)5月13日
(54)【発明の名称】レーザー印字用積層体およびその印字体
(51)【国際特許分類第6版】

B41M 5/26
G11B 7/24 571

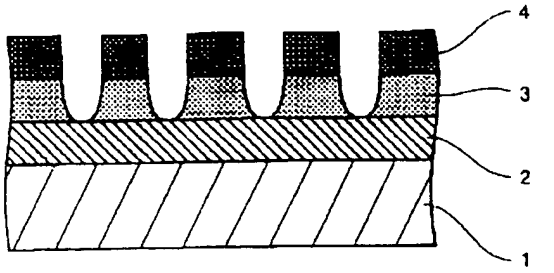
【FI】

B41M 5/26 S
G11B 7/24 571 A 8721-5D

【審査請求】未請求
【請求項の数】11
【出願形態】FD
【全頁数】7
(21)【出願番号】特願平7－309880
(22)【出願日】平成7年(1995)11月2日
(71)【出願人】
【識別番号】000002897
【氏名又は名称】大日本印刷株式会社
【住所又は居所】東京都新宿区市谷加賀町一丁目1番1号
(72)【発明者】
【氏名】小澤 充也
【住所又は居所】東京都新宿区市谷加賀町一丁目1番1号 大日本印刷株式会社内
(72)【発明者】
【氏名】林 一好
【住所又は居所】東京都新宿区市谷加賀町一丁目1番1号 大日本印刷株式会社内
(72)【発明者】
【氏名】清水 孝二
【住所又は居所】東京都新宿区市谷加賀町一丁目1番1号 大日本印刷株式会社内
(72)【発明者】
【氏名】下山田 正博
【住所又は居所】東京都新宿区市谷加賀町一丁目1番1号 大日本印刷株式会社内
(74)【代理人】
【弁理士】
【氏名又は名称】小西 淳美

要約

(57)【要約】
【課題】レーザー光照射により、鮮明な印字が高速で行え、且つ、印字された部分が各種の耐性に優れたレーザー印字用積層体およびその印字体を提供する。
【解決手段】基材1の表面に少なくとも下地層2と、レーザー光照射により除かれ得る隠蔽層3、更にはOP層4を順に設け、且つ、下地層2と隠蔽層3とは容易に視認できる明度差を有する異なる色の層の組み合わせで設けてレーザー印字用積層体を構成する。そして、その表面からレーザー光を出力調整して文字等のパターン状に隠蔽層以上3、4を除くように照射することにより、鮮明で各種耐性に優れた印字体が得られる。



請求の範囲

【特許請求の範囲】
【請求項1】基材の一方の面に、少なくとも下地層と、レーザー光照射により除かれ得る隠蔽層とが順に積層されていることを特徴とするレーザー印字用積層体。
【請求項2】隠蔽層がレーザー光の透過性を有し、下地層がレーザー光の吸収能を有することを特徴とする上記の請求項1に記載するレーザー印字用積層体。
【請求項3】下地層が墨インキ層であることを特徴とする上記の請求項1または2に記載するレーザー印字用積層体。
【請求項4】隠蔽層と下地層とが容易に視認可能な明度差を有する異なる色の着色層で形成されていることを特徴とする上記の請求項1、2または3に記載するレーザー印字用積層体。
【請求項5】下地層がレーザー光の吸収能の差を有する少なくとも上下の2層構造からなり、上側下地層が下側下地層に較べてレーザー光の高い吸収能を有することを特徴とする上記の請求項1、2、3または4に記載するレーザー印字用積層体。
【請求項6】下地層がレーザー光の吸収能の差を有する少なくとも上下の2層構造からなり、上側下地層が下側下地層に較べてレーザー光の高い吸収能を有し、且つ、下側下地層が上側下地層と同系色の色であることを特徴とする上記の請求項1、2、3、4または5に記載するレーザー印字用積層体。
【請求項7】隠蔽層が金属粉または金属酸化物粉を含有するインキ層であることを特徴とする上記の請求項1、2、3、4、5または6に記載するレーザー印字用積層体。
【請求項8】下地層が、上下の2層構造を有し、上側下地層がカーボンブラックを含有する墨インキ層であり、下側下地層がカーボンブラック以外の色材で調色されたインキ層であることを特徴とする上記の請求項1、2、3、4、5、6または7に記載するレーザー印字用積層体。
【請求項9】隠蔽層の上に、更にオーバープリント層を設けてなることを特徴とする上記の請求項1、2、3、4、5、7または8に記載するレーザー印字用積層体。
【請求項10】基材の一方の面に、少なくとも下地層と、レーザー光照射により除かれ得る隠蔽層、または少なくとも下地層と、レーザー光照射により除かれ得る隠蔽層とオーバープリント層とが順に積層されているレーザー印字用積層体に、その隠蔽層またはオーバープリント層側からレーザー光を照射して、隠蔽層または隠蔽層とオーバープリント層とを除去し、下地層と隠蔽層との色の対比でレーザー印字画像を形成してなることを特徴とする印字体。
【請求項11】基材の一方の面に、少なくとも下地層と、レーザー光照射により除かれ得る隠蔽層、または少なくとも下地層と、レーザー光照射により除かれ得る隠蔽層とオーバープリント層とが順に積層されているレーザー印字用積層体に、その隠蔽層またはオーバープリント層側からレーザー光を照射して、隠蔽層または隠蔽層とオーバープリント層とを除去し、下地層と隠蔽層との色の対比でレーザー印字画像を形成してなることを特徴とするラベル。

詳細な説明

【発明の詳細な説明】
【0001】
【発明の属する技術分野】本発明は、レーザー印字用の積層体およびその印字体に関し、更に詳しくは、レーザー光の照射により、鮮明な印字が高速で行え、且つ、印字された部分の耐光性、耐擦傷性、耐水性、耐薬品性などの性能が優れたレーザー印字用積層体およびその印字体の技術に関する。

【0002】
【従来の技術】従来、印字方法としては、例えば、■溶液タイプのインキを各種の版式により被印字体に転移させ、乾燥して印字する方法、■インクリボンなどを用いるサーマルヘッドプリンターなどにより熱転写方式で印字する方法、■インクジェット方式により液状のインキを微小口径のノズルより噴出させて印字する方法などが利用されている。
【0003】しかし、これらの方法は、例えば被印字体が、ラベル、カートン、プラスチック製の袋など食品用の包装材料であって、その製造年月日、賞味期限、ロット番号、製造工場などを内容物の充填包装ラインで印字する場合、近年のラインの高速化や多品種小ロット化、省力化などから様々な問題点を生じている。
【0004】具体的には、■の印字方法の場合、版の交換やインキの補充、粘度管理などのメンテナンスに手間が掛かり、また、インキの乾燥に時間を要し、高速ラインへの対応には限界があること、更に、インキの密着性や耐摩擦性にも問題を生じ易いことなどである。この点■の印字方法は、液状インキを用いないためインキの粘度管理や乾燥時間などの問題は解消されるが、インクリボンの交換は必要であり、高速ラインへの対応においても必ずしも充分ではなく、また、被印字体の形状などに制約があり、印字にかかるコストも上昇する欠点がある。また、■の印字方法は、高速性があり印字も鮮明に行えるため、高速ラインへの対応は可能となるが、液状のインキをライン内で使用することからその衛生性、或いは、インキ交換などのメンテナンス性に問題があり、また、インキに起因すると思われるノズル詰まりを生じ易く、印字の不良率が高くなりやすい欠点があった。
【0005】上記のような印字方法の欠点は、特に、被印字体が飲料などの瓶用ラベルである場合に顕著に現れる。即ち、飲料などの瓶詰めラインは、一般的に高速化されており、内容物がホット充填されるものが多く、充填・密封し、ラベル貼りした後、搬送コンベヤーで送られる際、瓶同士がぶつかり合うとか、また、瓶を保護するための瓶用コート液が塗布されたり、更に、飲用に際しては冷水に浸漬して冷却される場合もあり、ラベル自体もこれらの過酷な条件に曝されるため、印字部分についても同様にこれらの条件に耐えられる性能が必要となる。
【0006】このような条件に適合させるために、瓶詰め飲料の製造年月などの表示においては、例えば、ラベルの周囲に予め年月などの表示事項を絵柄などと共に印刷しておいて、充填時に該当箇所にノッチ(切り抜き)を入れて表示する方法、或いは、ラベルの印字部にレーザー発色タイプのインキを予め印刷しておいて、この部分にレーザー光を照射して印字する方法、更には、ラベルの印字部にレーザー光照射により、これを吸収し、発熱・破壊されて除かれ得る着色インキ層を予め印刷しておいて、この部分にレーザー光を照射して文字などパターン状に着色インキ層を除き、下地のラベル基材(紙)の色との対比で印字する方法などが提案され、また、実施されてきている。
【0007】
【発明が解決しようとする課題】しかしながら、上記のような表示、或いは、印字技術についても尚、問題点が存在する。例えば、ノッチ(切り抜き)を入れて表示する場合には、切りカスが出ること、また、ラベル貼り後、ノッチ部分がきっかけとなってラベルの破れなどを生じ易いなどの問題があった。そして、レーザー発色タイプのインキを予め印刷しておいて、レーザー光の照射により発色させて印字する方法では、高速印字は可能であるが、インキが耐光性や耐薬品性などに劣り、特に紫外線に曝された場合、変色を起こすほか、レーザーの出力調整も必要であり、ラベルの最外層にオーバーコート層を設けた場合、過度な出力での照射によりオーバーコート層が破壊され、その後の瓶コート液などの塗布により、印字が消色するという問題があった。
【0008】また、ラベルの印字部分に、レーザー光を吸収し、発熱・破壊されて除かれ得る着色インキ層を予め印刷しておいて、レーザー光の照射により文字などのパターン状にこのインキを除き、下地のラベル基材(紙)の色との対比で印字を行う方法でも、高速印字は可能であるが、印字の鮮明さがやや不足し、また、印字部分のオーバーコート層及びインキ層が完全に除かれるため、印字部分が耐擦傷性、耐水性などに欠ける問題があった。
【0009】従って、本発明は、以上のような問題点を解決し、レーザー光の照射により、鮮明な印字が高速で行え、且つ、印字された部分の耐光性、耐擦傷性、耐水性、耐薬品性などの性能の優れたレーザー印字用積層体およびその印字体を提供することを目的とするものである。
【0010】
【課題を解決するための手段】上記の課題を解決するため、本発明者らは、鋭意研究した結果、基材表面に、少なくとも下地層と、レーザー光を吸収し、発熱・破壊されて除かれ得る隠蔽層とを、容易に視認できる明度差を有する異なる色の層、例えば、白インキ層と墨インキ層、墨インキ層と

銀インキ層などの組み合わせで設けておき、その表面からレーザー光を出力調整して、文字などパターン状に隠蔽層を除くように照射することにより、下地層と隠蔽層の色の対比で鮮明な印字が可能となり、また、下地層が基材表面に残留して基材を保護するため、印字部および基材の両者が各種の耐性に優れていることを見出し、本発明の完成に至ったものである。

【0011】即ち、本発明は、基材の一方の面に、少なくとも下地層と、レーザー光照射により除かれ得る隠蔽層とが順に積層されていることを特徴とするレーザー印字用積層体からなる。更に、本発明は、前記隠蔽層と下地層とが容易に視認可能な明度差を有する異なる色の着色層で形成され、且つ、該下地層が少なくとも上下の2層構造を有し、該上側下地層がレーザー光の吸収能を有し、該下側下地層が、上側下地層と同系色の色であると同時に、レーザー光の透過性を有することを特徴とするレーザー印字用積層体からなる。

【0012】また、本発明は、前記隠蔽層が金属粉を含有するインキ層であることを特徴とするレーザー印字用積層体である。そして、また、本発明は、前記下地層が、上下の2層構造を有し、該上側下地層がカーボンブラックを含有する墨インキ層であり、該下側下地層がカーボンブラック以外の色材で調色された墨インキ層であることを特徴とするレーザー印字用積層体からなる。

【0013】

【発明の実施の形態】以下に本発明の実施の形態について説明する。本発明のレーザー印字用積層体は、積層体の各層のレーザー光に対する吸収の差を利用することを基本とするものである。そして、本発明において使用するレーザー光としては、波長10．6μmの炭酸ガスレーザーが適している。この波長の光は、特定の着色剤、例えば、カーボンブラックには効果的に吸収されるため、カーボンブラックを含有する着色層に照射すると、これを吸収し発熱するが、酸化チタン（白）やカーボンブラック以外の通常の印刷インキ用着色剤にはあまり吸収されず、これらの着色剤を用いた着色層に照射しても吸収が少なく発熱も少ない。

【0014】従って、レーザーの吸収能を有する着色層に、レーザーを出力調整して集光し、文字などのパターン状に照射することにより、照射された部分がその材質により、発熱・溶融・ミスト化、或いは、発熱・分解・灰化し、パターン状に除去することができる。しかし、レーザーの吸収能の少ない着色層では、レーザー光が照射されても、過度の出力でない限り、発熱も少なく除去されることはない。本発明のレーザー印字用積層体では、炭酸ガスレーザーを使用して照射強度0．5～2．0J／cm^2 の範囲で出力調整することにより良好な印字が得られている。

【0015】本発明のレーザー印字用積層体は、上記のようなレーザーの被照射体の材質による選択的な吸収作用を利用して、鮮明な印字が行えるように構成したものであり、その構成は最低でも基材、下地層、隠蔽層の3層の積層構成としたものである。この場合、基材上に下地層として例えばレーザー光の吸収の少ない酸化チタンを用いた白インキ層を設け、その上に隠蔽層として隠蔽性がよく、且つ、レーザー光の吸収性のよいカーボンブラックを含有する墨インキ層を設けることにより、外側からレーザー光を照射して印字した場合、墨インキ層が発熱して除かれ、下地層の白インキ層が露出して、墨と白との対比により鮮明な印字が形成できる。

【0016】只、本発明のレーザー印字用積層体は、前記したように、ラベル、カートン、プラスチック製の袋などの包装材料の印字部分にも組み込んで使用できるようにしたものであり、その場合には印字部分についても他の絵柄部分と同様に、その外観、意匠性、および各種の耐性についても優れたものにする必要がある。従って、その構成も前記の3層構成に限定されず、更に多層の構成も可能にしたものである。例えば、基材に紙、板紙を用いる場合、それらの単体でもよいが、表面にアルミニウム箔やプラスチックフィルムなどをラミネートした加工紙、或いは、アルミニウムを蒸着した加工紙も使用でき、その構成は自由である。また、基材にプラスチックフィルムを用いる場合も単体に限らず任意の積層フィルムを用いることができる。

【0017】また、隠蔽層の上に、耐擦傷性その他必要な耐性を付与するために、最外層としてオーバープリント層（以下OP層またはOPニスという）を設けてもよく、下地層および隠蔽層をそれぞれ複数の層で設けてもよい。例えば、意匠性の点から隠蔽層を墨以外の色にしたい場合は、墨インキ層の上に他の色の着色層を重ねて設けてもよく、また、墨インキ層に換えて隠蔽性のよい銀インキなど金属粉を含有するインキを用いることもできる。只、隠蔽層に銀インキなどの金属粉を含有するインキを用いた場合は、それ自体レーザー光の吸収性が低いため、その下の下地層を、例えば上下2層の積層構成とし、上側下地層にカーボンブラックを含有する墨インキ層を用い、下側下地層にカーボンブラックを含有しない調色による墨インキ層を用いればよい。

【0018】このような積層構成を採ることにより、隠蔽層の例えば銀インキ層の上にOP層が設けられている場合でも、レーザー光の照射により、上側下地層のカーボンブラックを含有する墨インキ層が強く発熱し、その上の隠蔽層およびOP層も一緒にミスト化し、除去されて印字が形成され

る。この時、視覚的には下地層の墨色は、隠蔽層の銀インキ層で隠されており、レーザー光は、照射しても銀インキ層で遮断されて上側下地層のカーボンブラックを含有する墨インキ層まで到達しないように思われるが、実際には、金属粉の隙間からの透過、或いは反射などにより上側下地層まで達していると判断され、充分な発熱が得られると共に、銀色と墨色の対比による鮮明な印字が形成されている。

【0019】次に、本発明において、レーザー印字用積層体の具体例について図面を用いて説明すると、図1乃至図4は、本発明にかかるレーザー印字用積層体の層構成を示す断面図である。まず、本発明にかかるレーザー印字用積層体の第1の例は、図1に示すように、基材1の一方の面に、少なくとも下地層2と、レーザー光照射により除かれ得る隠蔽層3とOP層4とが順に積層されている構成からなるレーザー印字用積層体である。次に、本発明にかかるレーザー印字用積層体の第2の例は、図2に示すように、下地層が少なくとも上下の2層構造を有し、該上側下地層2Bがレーザー光の吸収能を有し、該下側下地層2Aが、上側下地層と同系色の色であると同時に、レーザー光の透過性を有することを特徴とするレーザー印字用積層体である。更に、具体的に、本発明にかかるレーザー印字用積層体の層構成を例示すると、図3に示すように、下地層が、上下の2層構造を有し、該上側下地層がカーボンブラックを含有する墨インキ層2Dであり、該下側下地層がカーボンブラック以外の色材で調色された墨インキ層2Cであることを特徴とするレーザー印字用積層体である。また、本発明にかかるレーザー印字用積層体の層構成を具体的に例示すると、図4に示すように、前記隠蔽層が金属粉を含有するインキ層3Aであることを特徴とするレーザー印字用積層体である。なお、上記の図2、図3および図4中において、符号1、2、3および4は、それぞれ、上記の図1中の符号と同じ意味である。また、上記の例示は、本発明にかかるレーザー印字用積層体の二三の例示であり、これらによって本発明は限定されるものでなく、本発明においては、下地層、隠蔽層、OP層等を構成するに際し、任意に素材を選定し、且つそれらを組み合わせて各層を形成してよい。

【0020】次に、上記の本発明において、上記のレーザー印字用積層体を使用して印字する方法について説明すると、上記のような構成からなるレーザー印字用積層体のOP層の面から、公知のレーザー照射機を使用してレーザー光を照射して、OP層、隠蔽層等を除去して下地層を露出させ、該隠蔽層と下地層との色の対比によって所望の印字を行なうものである。具体例について、図を用いて説明すると、図5に示すように、基材1の一方の面に、少なくとも下地層2と、レーザー光照射により除かれ得る隠蔽層3とOP層4とが順に積層されている構成からなるレーザー印字用積層体にレーザー光を照射すると、OP層4および隠蔽層3が除去され、下地層2が露出し、而して、その露出した下地層2と隠蔽層3との色の対比によって所望の印字画像を形成するものである。上記において、レーザー光としては、前述のように、本発明においては、炭酸ガスレーザーを使用して照射強度0.5～2.0J／cm^2 の範囲で出力調整することにより良好な印字体が得られている。なお、本発明においては、本発明にかかるレーザー印字用積層体にレーザー光を照射し、その照射部分において、印字される機構、理由等については、詳らかではないが、レーザー光を照射することによって、層中でそれを吸収し、発熱し、その部分の層が溶融、除去、その他等の現象を起こして印字されるものであると思われる。

【0021】

【実施例】上記の本発明について以下に実施例を挙げて更に詳細に説明する。

実施例1アルミ蒸着紙（本州製紙株式会社製）のアルミ蒸着面上に、酸化チタン30%を含有するポリアミド系樹脂をビヒクルとする白インキIBL－962（ザ・インクテック株式会社製）、および顔料として12%のカーボンブラックを含有したポリアミド系樹脂をビヒクルとする墨インキIBL－991（ザ・インクテック株式会社製）を使用して順に、グラビア印刷法にてそれぞれ3μmの厚さで塗工した。その上に、硝化綿18%を含有するOPニスを使用して、グラビア印刷法にて約1μmの厚さで塗工して、下記の仕様からなるレーザー印字用積層体を製造した。

OPニス／カーボン墨インキ／白インキ／アルミ蒸着紙【0022】実施例2上記の実施例1において、白インキと墨インキの塗工順序を入れ換えて、以下は実施例1と同様に行なって、下記の仕様からなるレーザー印字用積層体を製造した。

OPニス／白インキ／カーボン墨インキ／アルミ蒸着紙【0023】実施例3上記の実施例2において、カーボン墨インキの代わりに、黄、紅、藍の有機顔料を含有するポリアミド系樹脂をビヒクルとする調色墨インキ（ザ・インクテック株式会社製）を使用し、以下は上記の実施例2と同じ条件で行なって、下記の仕様からなるレーザー印字用積層体を製造した。

OPニス／白インキ／調色墨インキ／アルミ蒸着紙【0024】実施例4アルミ蒸着紙（本州製紙株式会社製）のアルミ蒸着面上に、顔料として12%のカーボンブラックを含有するポリアミド系樹脂

をビヒクルとする墨インキIBL－991（ザ・インクテック株式会社製）、および顔料として粒径6μmのリーフィングタイプアルミペーストを6%含有するポリアミド系樹脂をビヒクルとする銀インキ（ザ・インクテック株式会社製）を使用して順に、グラビア印刷法にてそれぞれ3μmの厚さで塗工した。更に、上記の実施例1と同様に、その上に、硝化綿18%を含有するOPニスを使用して、グラビア印刷法にて約1μmの厚さで塗工して、下記の仕様からなるレーザー印字用積層体を製造した。

OPニス／銀インキ／カーボン墨インキ／アルミ蒸着紙【0025】実施例5上記の実施例4において、カーボン墨インキの代わりに、黄、紅、藍の有機顔料を含有するポリアミド系樹脂をビヒクルとする調色墨インキ（ザ・インクテック株式会社製）を使用し、以下は上記の実施例4と同じ条件で行なって、下記の仕様からなるレーザー印字用積層体を製造した。

OPニス／銀インキ／調色墨インキ／アルミ蒸着紙【0026】実施例6アルミ蒸着紙（本州製紙株式会社製）のアルミ蒸着面上に、上記の実施例4および実施例5で用いたポリアミド系樹脂をビヒクルとする調色墨インキ、カーボンブラックを顔料とするポリアミド系樹脂をビヒクルとする墨インキIBL、およびポリアミド系樹脂をビヒクルとする銀インキ（以上、ザ・インクテック株式会社製）を使用して、順にグラビア印刷法にてそれぞれ約3μmの厚さで塗工した。その上に、上記の実施例1と同様に、硝化綿18%を含有するOPニスを使用して、グラビア印刷法にて約1μmの厚さで塗工して、下記の仕様からなるレーザー印字用積層体を製造した。

OPニス／銀インキ／カーボン墨インキ／調色墨インキ／アルミ蒸着紙【0027】実施例7上記の実施例6において、調色墨インキの代わりに、ポリアミド系樹脂をビヒクルとする紅インキIBL－121（ザ・インクテック株式会社製）を使用して、以下は上記の実施例6に記載した方法と同様に行なって、下記の仕様からなるレーザー印字用積層体を製造した。

OPニス／銀インキ／カーボン墨インキ／紅インキ／アルミ蒸着紙【0028】比較例1アルミ蒸着紙（本州製紙株式会社製）のアルミ蒸着面上に、顔料として12%のカーボンブラックを含有したポリアミド系樹脂をビヒクルとする墨インキIBL－991（ザ・インクテック株式会社製）を使用して、グラビア印刷法にて約3μmの厚さで塗工した。その上に、硝化綿18%を含有するOPニスを使用して、グラビア印刷法にて約1μmの厚さで塗工して、下記の仕様からなるレーザー印字用積層体を製造した。

OPニス／カーボン墨インキ／アルミ蒸着紙【0029】比較例2アルミ蒸着紙（本州製紙株式会社製）のアルミ蒸着面上に、ロイコ系レーザー発色インキ（大日本インキ化学工業株式会社製）を使用して、グラビア印刷法にて約3μmの厚さで塗工した。その上に、硝化綿18%を含有するOPニスを使用して、グラビア印刷法にて約1μmの厚さで塗工して、下記の仕様からなるレーザー印字用積層体を製造した。

OPニス／レーザー発色インキ／アルミ蒸着紙【0030】試験例上記の実施例1～7、および比較例1～2で製造したレーザー印字用積層体に対し、下記の評価試験を行い、その結果について、下記の表1に示す。

1. 印字テスト上記の実施例1～7、および比較例1～2で製造したレーザー印字用積層体について、OPニス面上から、TEA型炭酸ガスレーザー、LASERMARK－920（カナダ国、ルモニクス社製）を用いて照射エネルギー0. 8J／cm^2でメタルマスクを通して1ショット照射してマーキングし、この照射サンプルの文字視認性を目視にて確認した。

2. 耐瓶コーティング剤試験マーキングした印刷サンプルにシリコン系のコーティング剤を塗布し、30分後に状態を観察した。

3. 耐候性試験キセノンウェザーメーター（ズカ試験機株式会社製）を使用し、出力320W／m^2で可視光、紫外線を24時間照射した。

【0031】

【表1】

	印字テスト	耐瓶コーティング剤試験	耐候性
実施例1	△	◎	◎
実施例2	△	△	◎
実施例3	△	△	◎
実施例4	◎	○	◎
実施例5	◎	○	◎
実施例6	◎	◎	◎
実施例7	◎	◎	◎
比較例1	×	◎	◎
比較例2	○	×	×

【0032】上記の表1において、各記号の意味は、次のとおりである。
1. 印字テスト◎：認識性が高く非常に良好○：良好△：認識可能×：認識不可能2. 耐瓶コーティング試験◎：全く侵されない○：ほぼ侵されない△：一部侵されて下アルミ地が露出×：完全に侵されて下アルミ地が露出3. 耐候性◎：全く照射前と変化なし×：印字部、非印字部ともに黄色へ変色し、一部印字消失【0033】以上、上記の表1より明らかなように、本発明にかかるレーザー印字用積層体においては、優れた発色性を示すとともに、耐瓶コーティイグ剤適性、耐候性を有することが判る。特に、実施例4～7にかかるレーザー印字用積層体においては、優れた発色性を示した。また、特に、実施例6～7にかかるレーザー印字用積層体については、耐瓶コーティイグ剤に対しても優れた適性を有するものであった。これに対し、比較例1にかかるレーザー印字用積層体については、耐瓶コーティング剤適性、耐候性は、優れているものの、発色性が著しく劣り、0. 8J／cm^2 の照射強度では良好な印字認識性を得られなかった。また、比較例2にかかるレーザー印字用積層体については、感熱発色タイプのインキにおいては、発色性は良好なものの、耐瓶コーティング剤によるインキの脱落、印字の消失が認められ、また、耐候性評価により、印字部、非印字部ともに黄色へ変色し、一部印字の消失が認められた。
【0034】
【発明の効果】以上の説明で明らかなように、本発明は、基材表面に、少なくとも下地層と、レーザー光を吸収し、発熱・破壊されて除かれ得る隠蔽層とを、容易に視認できる明度差を有する異な色の層、例えば、白インキ層と墨インキ層、墨インキ層と銀インキ層などの組み合わせで設けておき、その表面からレーザー光を出力調整して、文字などパターン状に隠蔽層を除くように照射することにより、下地層と隠蔽層の色の対比で鮮明な印字が可能となり、また、下地層が基材表面に残留して基材を保護するため、印字部および基材の両者が各種の耐性に優れているレーザー印字記録を行なうことができるというものである。

図の説明

【図面の簡単な説明】
【図1】本発明にかかるレーザー印字用積層体の第1の例の層構成を示す断面図である。
【図2】本発明にかかるレーザー印字用積層体の第2の例の層構成を示す断面図である。
【図3】本発明にかかるレーザー印字用積層体の具体例の層構成を示す断面図である。
【図4】本発明にかかるレーザー印字用積層体の別の具体例の層構成を示す断面図である。

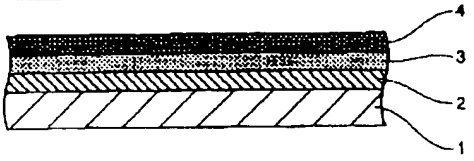
【図5】本発明にかかるレーザー印字用積層体を使用してレーザー印字した状態の層構成を示す断面図である。

【符号の説明】

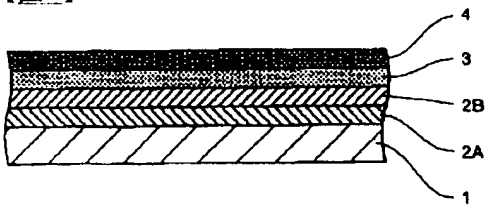
1 基材
2 下地層
3 隠蔽層
4 OP層

図面

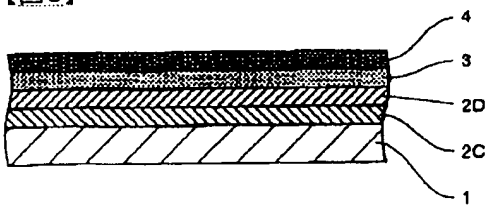
【図1】



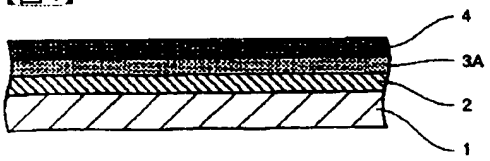
【図2】



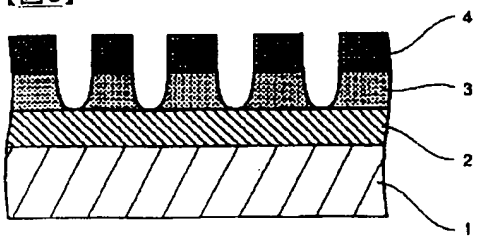
【図3】



【図4】



【図5】



JP-1-H09-123606

(19) JAPANESE PATENT OFFICE (JP)

(12) PUBLICATION OF UNEXAMINED PATENT APPLICATION (A)

(11) Kokai (Unexamined) Patent Publication Number: 9-123606

(43) Date of Disclosure: May 13, 1997

(51) Int. Cl.[6]	ID Symbol	Internal No.	FI	Technology Disclosure
B 41 M 5/26			B 41 M 5/26	S
G 11 B 7/24	571	8721-5D	G 11 B 7/24	571 A

Examination requested: not yet requested
Number of Claims: 4 FD (total of 7 pages)

(21) Application Number: 7-309880
(22) Filing Date: November 2, 1995

(71) Applicant: 000002897
Dainippon Printing Co., Ltd.
Tokyo-to, Shinjuku-ku, Ichigaya, Kaga-cho, Itchome, 1-ban, 1-go,

(72) Inventor: Mitsunari OZAWA
c/o Dainippon Printing Co., Ltd.
Tokyo-to, Shinjuku-ku, Ichigaya, Kaga-cho, Itchome, 1-ban, 1-go,

(72) Inventor: Kazuyoshi HAYASHI
c/o Dainippon Printing Co., Ltd.
Tokyo-to, Shinjuku-ku, Ichigaya, Kaga-cho, Itchome, 1-ban, 1-go,

(72) Inventor: Koji SHIMIZU
c/o Dainippon Printing Co., Ltd.
Tokyo-to, Shinjuku-ku, Ichigaya, Kaga-cho, Itchome, 1-ban, 1-go,

(74) Representative: Junmi KONISHI, patent attorney Continues on the last page

(54) Title of the Invention: LAMINATE FOR LASER PRINTING AND PRINT THEREOF

(57) Summary

(Task)

To provide a laminate for printing and print thereof having superior resistance in respective printed parts, enabling to print clear characters at a high speed with the emission of laser light.

(Solution Means)

On the surface of a substrate are deployed sequentially at least a lower foundation layer 2, a masking layer 3, which can be removed by irradiation with laser light, and an OP layer 4. In addition, the laminated structure for laser printing is created by combining layers which have different colors and a different level of brightness, easily observed visually, in the lower foundation layer 2 and the masking layer 3. Also, printing can be obtained with different types of superior resistance by irradiation used to remove the masking layers 3, 4 from the surface in the pattern shape of letters or the like with an adjusted output of laser light.

[figure]

(Scope of the Patent's Claim)

(Claim 1)

A laminate for laser printing, characterized by the fact that a sequentially laminated structure is created on one surface of a base material, comprising at least a foundation layer, and a masking layer that can be removed by irradiation with laser light.

(Claim 2)

The laminate for laser printing described in claim 1, characterized by the fact that a masking layer has permeability to laser light, and the foundation layer has a laser light absorbing capability.

(Claim 3)

Laminate for laser printing, characterized by the fact that the foundation layer is a black ink layer.

(Claim 4)

The laminate for laser printing described in claim 1, 2, or 3, characterized by the fact that the masking layer and the foundation layer are formed with a coloring layer having a different brightness enabling easy visual confirmation.

(Claim 5)

The laminate for laser printing described in claim 1, 2, 3 or 4, characterized by the fact that the foundation layer has a 2-layered structure comprising at least an upper and a lower layer having different laser light absorbing capacity, wherein the foundation layer on the upper side has a higher laser light absorbing capacity when compared to the foundation layer on the lower side.

(Claim 6)

The laminate for laser printing described in claim 1, 2, 3, 4 or 5, characterized by the fact that the foundation layer has a 2-layered structure comprising at least an upper and a lower layer having different light absorbing capacity, wherein the foundation layer on the upper side has a higher laser light absorbing capacity when compared to the foundation layer on the lower side, and in addition, the color of the foundation layer on the lower side is of the same color type as the foundation layer on the upper side.

(Claim 7)

The laminate for laser printing described in claim 1, 2, 3, 4, 5 or 6, characterized by the fact that the masking layer is an ink layer containing a metal powder or metal oxide powder.

(Claim 8)

The laminate for laser printing described in claim 1, 2, 3, 4, 5, 6 or 7, characterized by the fact that the foundation layer has a 2-layered structure with an upper and a lower layer, having a black ink layer containing carbon black in the foundation layer on the upper side, while the foundation layer on the lower side is an ink layer with an adjusted tone using a different coloring material than carbon black.

(Claim 9)

The laminate for laser printing described in claim 1, 2, 3, 4, 5, 7 or 8, characterized by the fact that an overprint layer is created on top of a masking layer.

(Claim 10)

Print, characterized by the fact that on one surface of a base material is formed at least a foundation layer, a masking layer that can be removed by irradiation with laser light, or an overprint layer and a masking layer that can be removed by irradiation with laser light, in a laminate for laser print laminated sequentially;

wherein irradiation with laser light is applied from the side of this masking layer or of the overprint layer, the masking layer or the masking layer and the overprint layer are removed;

and a laser print image is formed by contrasting the color of the foundation layer to the color of the masking layer.

(Claim 11)

A label, characterized by the fact that on one surface of a base material is created at least one foundation layer, a masking layer that can be removed with laser light, or at least a foundation layer, and an overprint layer and a masking layer that can be removed by irradiation with laser light, in a sequentially laminated laminate for laser printing;

wherein irradiation with laser light is applied from the side of the masking layer or of the overprint layer, the masking layer or the masking layer and the overprint layer are removed, and a laser print image is formed by contrasting the color of the foundation layer to the color of the masking layer.

(Detailed Explanation of the Invention)

(0001)

(Sphere of Technology Belonging to the Invention)

This invention relates to a laminate for laser printing and to a print thereof. More specifically, it relates and to a laminate for laser printing having superior characteristics enabling clear and distinct printing at a high speed by irradiation with laser light, as well as excellent resistance of the printed part to light, resistance to damage by rubbing, resistance to water, resistance to chemicals and other characteristics, and to a technology for print.

(0002)

(Prior Art Technology)

Printing methods that were used according to prior art include for example (1) printing methods for printing with the solution type of ink, transferred to a print, which is followed by drying, (2) printing methods according to the thermal transfer method using a thermal head printer or a similar printer with an ink ribbon, (3) printing methods using the inkjet method wherein droplets of ink are discharged from very small nozzle openings, and other methods.

(0003)

However, when these methods are used for example to print a label or to create printing on packing material such as a carton or a plastic bag containing foodstuffs to create printing on a packing line identifying the content such as the manufacturing date, expiration date, lot number, manufacturing plant and the like, various problems related to a labor saving design occurred as

the high-speed design of such lines is nowadays common, and small lots are used for many products.

(0004)

Specifically, when method (1) was used for printing, high maintenance was required for things like ink refilling and plate replacing operations, as well as adhesion control, etc. Moreover, there were limits to the applicability of a high-speed line in this case because drying of the ink took time and other problems such as problems related to adhesion of ink and resistance to rubbing could also easily occur. Although it was possible to solve these problems in this respect with method (2) because the liquid form of ink was not used, as well as problems related to management of adhesion and the drying time, because this method requires ink ribbons that must be replaced, the method was again not very compatible with the high-speed design. The method also imposed restrictions on the shape of the print, etc., and another disadvantage was a higher cost. Further, because method (3) can be used for printing high-speed characteristics and a clear and distinct print is created, the method is compatible with a high-speed line. However, because the liquid form of ink is used in the line, this creates problems related to hygiene and to the maintenance characteristics since ink must be replaced, and because nozzles can be easily clogged with ink, another disadvantage is that the ratio of poor quality prints can be high.

(0005)

Disadvantages of the above described printing methods are apparent in particular in case of printing used on beverages such as labels on common types of bottles. Specifically, while lines employed for filling of bottles with beverages and the like use the high-speed design, the content put into the bottles is often hot, and after the bottle has been filled, it must be hermetically sealed and a label is affixed. When the bottles are then transported by a conveyer, individual bottles can collide with each other so that the bottles must be coated with a protective coating solution. The bottles are also cooled by being immersed in ice water, and because the label itself is thus exposed to very severe conditions, the printed part must be able to withstand the same severe conditions as well.

(0006)

To be compatible with these conditions, several methods for printing were proposed and realized. For example, in order to display the manufacturing date of a beverage in a bottle, a notch (cutout) is created according to one display method in the appropriate location at the time when the bottle is filled in a visual frame containing displayed items printed in advance, such the date, on the periphery of the label. According to another method, printing is performed in advance in the print part of the label with the laser dye type of ink, and the print part of the label is irradiated with laser rays. When these laser rays are absorbed, heat is generated, which destroys and removes the dye ink layer preprinted in advance so that a coloring ink layer is

removed in the pattern of letters, etc., when this part is irradiated with laser rays, creating contrast printing relative to the color of the material on the foundation of the label (paper).

(0007)

(Task To Be Achieved By This Invention)

However, the above mentioned displaying or printing techniques still have some unresolved problems. For example, in case of the displaying in the form of a notch (cutout), trash is created after the cutting, and after the label is affixed, the problem was that the notch part increased the likelihood that the label would be torn or that another accident could easily happen. Also, although it was possible to achieve high-speed printing when printing was done in advance with the laser coloring type of ink and coloring was induced by irradiation with laser rays, the light resistance characteristics of the ink were poor and so was resistance of the ink to chemicals. In particular, discoloration would occur when the print was exposed to ultraviolet light, which means that the output of the laser had to be adjusted, and if an overcoat layer was created on the outermost layer of the label, the problem was that the overcoat layer could be easily destroyed with an excessive irradiation output, resulting in so called color dissipation of the print by the coating on a bottle coated with a coating solution, etc.

(0008)

Also, while high-speed printing was enabled when laser rays were absorbed on the printed part of the label in print created in advance with a coloring ink layer to be removed and destroyed by heat generation, so that letters or other patterns could be created by irradiation with laser light, or even with the contrast printing method contrasting the print color to the color of the base material of the label foundation (paper), the print was somewhat indistinct and the quality was mediocre. Also, because the overcoat layer and the ink layer of the print part were completely removed, another problem was that the rubbing resistance, resistance to water and other resistance related characteristics were lacking in the print part.

(0009)

Accordingly, in order to resolve the problem areas mentioned above, the purpose of this invention is to provide a laminate for laser printing and print thereof enabling a distinctive and clear print with printing at a high speed with irradiation with laser rays, having at the same time superior characteristics of the printed part, such as resistance to light, resistance to rubbing and damaging, resistance to water, and resistance to chemicals.

(0010)

Means To Solve Problems)

In order to achieve the above mentioned task, as a result of intensive research, a perfection of the present invention was achieved by the inventors who discovered this invention, wherein on the surface of a base material is provided at least a foundation layer, a masking layer that can be destroyed and removed by generation of heat when irradiated with laser rays, a color layer having a different brightness that is easily visible, created for example by combining a white ink layer with a black ink layer, and a black ink layer with a silver ink layer or the like, so that when irradiation is applied with adjusted output of laser light from the surface in order to remove a masking layer in the pattern of letters or the like, a clear and distinct print contrasting the color of the foundation to the color of the masking layer becomes visible. In addition, the resistance characteristics of both types of materials, namely of the printed part and of the base material, are also excellent because a protecting member is left on the base material surface of the foundation layer.

(0011)

Specifically, this invention provides a laminate structure for laser printing characterized in that it comprises a foundation layer at least on one surface of the base material, and a masking layer which can be removed by irradiation with laser rays in a sequential order. In addition, according to this invention, the laminate for laser printing is characterized by the fact that said masking layer is an ink layer containing metallic powder. The laminate for laser printing of this invention is also characterized in that said foundation layer has a structure consisting of two layers, an upper layer and a lower layer, the foundation layer on the upper side is a black ink layer containing carbon black, and the foundation layer on the lower side is a black ink layer with coloring material in a color tone other than the color tone of the carbon black.

(0012)

In addition, this invention provides a laminate for laser printing characterized by the fact that said masking layer is an ink layer containing metallic powder. This invention further also provides a laminate for laser printing characterized in that said foundation layer has a 2-layered construction including an upper and a lower layer, the foundation layer on the upper side is a black ink layer containing carbon black, and the foundation layer on the lower side is a black ink layer whose color tone is modified by a different coloring material than carbon black.

(0013)

(Embodiment Mode of the Invention)

The following is an explanation of an embodiment mode of this invention. The laminate for color printing of this invention is a laminate that uses a difference in absorption of laser light between the layers in the laminate. Also, for the laser light used in the invention is suitable a carbon dioxide gas laser with a wavelength of 10.6 μm. When light with this wavelength is used for irradiation of a coloring layer containing carbon black, the light will be effectively absorbed

by carbon black. However, although heat will be generated by this absorption, no significant amount of other absorption will occur in coloring agents used for ink that are normal utilized for printing, other than titanium oxide (white) or carbon black. When these coloring agents are used, absorption will be small and a low amount of heat will be generated even if irradiation is performed.

(0014)

Therefore, when the laser output is adjusted to a coloring layer having a laser absorbing capability, the laser rays are converged and letters and other pattern shapes are created by the irradiation, this makes it possible to remove a pattern shape from a partially irradiated substance by using heat generation, fusion, a mist system, or heat generation-dissolution-incineration. However, even if a coloring layer that has a low laser absorbing capability is irradiated with laser light, the heat generation will be small and removal of substance will not occur unless an excessive output is used. The laminate for laser printing of this invention uses carbon dioxide gas laser with an irradiation strength in the range of 0.5 ~ 2.0 J/cm^2, enabling to obtain optimal printing by adjusting the output.

(0015)

Because the laminate for laser printing of this invention uses the effect of absorption selectively depending on the substance irradiated with laser rays, the construction created enables to perform printing clearly and distinctly, and a laminated structure of 3 layers is created also on the lowermost part of this construction, comprising the base material, the foundation layer, and the masking layer. Because in this case, a white ink layer is created by using for example titanium oxide which has low absorption of laser light as a foundation layer below on the base material for good masking characteristics of the masking layer on top of that. In addition, because a black ink layer is created containing carbon black which has good absorption of laser light, when printing is conducted with irradiation with laser light from outside, the layer of black ink will be subjected to heat generation and removed and the layer of white ink in the foundation layer is exposed, enabling to form print with clear and distinctive characters thanks to the contrast between black and white.

(0016)

Also, as was described above, the laminate for laser print of this invention is designed so that it can be also incorporated in the print part of a packing material such as a label, a carton, a plastic bag or the like. In this case, another pattern part can be used in the same manner also on the printed part when superior characteristics are required such as external view, design characteristics and various types of resistance. However, the construction is not limited only to the above mentioned 3-layered structure as it is also possible to use many layers. For example, if paper or cardboard is used in the base material, such items can be used singly, or it is also possible to use converted paper provided with an aluminum foil or the like on the surface, or

laminated with a plastic film or a similar film, or converted paper on which aluminum was deposited with vapor deposition can be used freely in the construction. Also, although a plastic film is used in the base material, the design is not limited by this as any laminated film can be also used.

(0017)

Further, in order to impart required rubbing and damage resistance and other types of resistance to the top of the masking layer, an overprint layer (hereinafter called OP layer or OP varnish) can be created on the outermost layer, and a plurality of respective foundation layers and masking layers can be also created. For example, if a different color is desirable for the masking layer from the design viewpoint, a coloring layer having another color can be superimposed on top of the black ink layer, and it is also possible utilize ink containing metallic particles such as silver ink which has good masking characteristics instead of the black ink layer. Moreover, if a silver ink or a similar type of ink containing metallic particles is used in the masking layer, in order to reduce absorption characteristics of laser light as such, the foundation layer below can have a laminated structure consisting for example of 2 layers, an upper and a lower layer, while a black ink layer containing carbon black can be used in the foundation layer on the upper side, and a black ink layer with a different tone without the content of carbon black can be used in the foundation layer on the lower side.

(0018)

When this type of a laminate construction is employed, even if a masking layer is used such as an OP layer on top of a silver ink layer, strong heat will be generated in the black ink layer containing carbon black in the foundation layer on the lower side with irradiation with laser rays, and a mist system is also created together with the OP layer and with the masking layer on top of that and removed to create the print. At this point, the black color of the foundation layer is visually masked by the silver ink layer and even when irradiation is applied with laser light, it is assumed that the laser light will not reach up to the layer of the black ink containing carbon black in the foundation layer on the upper side that is shielded with the silver ink layer. In reality, however, as the light will be transmitted through the gap between the metallic particles or reflected, etc., it has been determined that the light does reach up to the foundation layer on the upper side, a sufficient amount of heat is generated and at the same time, a clear and distinct print is formed thanks to the contrast between the silver color and the black color.

(0019)

Next, Figure 1 through Figure 4 serve as diagrams explaining a concrete example of the laminate for laser printing of this invention, showing a cross-sectional view of the laminate construction of a laminate for laser printing according to this invention. First, in Embodiment 1 of a laminate for laser printing according to this invention shown in Figure 1, on one surface of a base material 1 is formed a sequential laminated structure comprising at least 1 foundation layer

2, an OP layer 4 and a masking layer 3, which can be removed by irradiation with laser light in a sequential structure of a laminate for laser printing. As shown in Figure 2, the foundation layer has a construction including at least 2 layers, an upper layer and a lower layer, and the foundation layer 2B on the upper side has a laser light absorbing capability, while the foundation layer 2A on the lower side has the same type of color as the foundation layer on the upper side. At the same time, the construction also has characteristics allowing transmission of laser light. Specifically, in an example indicating the structure of the layers of a laminate for laser printing according to this example shown in Figure 3, the foundation layer has a 2-layered construction including an upper and a lower layer, the foundation on the upper side is a black ink layer 2D containing carbon black, and the foundation layer on the lower side is a black ink layer 2C with a color tone of a coloring material other than that of carbon layer in accordance with the characteristics of the laminate for laser printing. Also, in a concrete example of the laminated structure of a laminate for laser printing shown in Figure 4, the laminate for laser printing is characterized by a masking layer having an ink layer 3A containing metallic powder. Further, the same symbols 1, 2, 3 and 4 are used in Figure 2, Figure 3, and Figure with the same meaning. Moreover, although two or three examples of a laminate for laser printing according to this invention are indicated in said examples, these example are not limiting with respect to this invention as it possible to create various combined layers or select any material texture in order to create the structure of the foundation layer, masking layer, OP layer, etc.

(0020)

The following is an explanation of the method used for printing with said laminate for laser printing. Irradiation is performed with a laser light using a well known type of a laser irradiation device from the surface of the OP layer of a laminate for laser printing having the above described construction, the OP layer, the masking layer, etc., are removed, the foundation layer is exposed, and desired printing is performed based on the contrast between the color of the masking layer and the color of the foundation layer. In a concrete example explained by using the figures, as shown in Figure 5, on one surface of the base material 1 is formed at least a foundation layer 2, and when the laminate for laser printing, having a sequentially laminated structure comprising an OP layer 4 and a masking layer 3 that can be removed by irradiation with laser light, is irradiated with the laser light, the OP Layer 4 and mask layer 3 are removed, the foundation layer 2 is exposed, and a desired print image can thus be formed by the contrast between the colors of the exposed foundation layer 2 and masking layer 3. As mentioned above, the laser light of the invention, described above, uses carbon dioxide gas with an emission strength in the range $0.5 \sim 2.0$ J/cm^2, which can be adjusted so as to obtain an optimal print. In addition, when the laminate for laser printing relating to this invention is irradiated with laser light according to this invention, although the exact reasons, etc., for the structure of the print in the irradiated part are not clear, it is thought that the print is caused by phenomena in the part which is irradiated by the laser light, which is absorbed in this layer, causing generation of heat, fusion, removal and the like.

(0021)

The following is a detailed explanation of an embodiment of this invention.

Embodiment 1

A polyamide resin containing 30% of titanium oxide was used on an aluminum vapor deposition surface of an aluminum vapor deposition paper (made by the Honshu Seishi K.K. Company) was used as a vehicle with white ink IBL-962 (made by The InkTech Co.), together with black ink IBL-991 (made by the InkTech Co.), using as a vehicle a polyamide resin containing 12% of carbon black employed as a pigment, in this sequence, and coating was then performed up to the thickness of 3 μ with the gravure printing method. On top of that was used an OP varnish layer containing 18% of nitrocellulose, and coating was applied with a thickness of about 1 μm with the gravure printing method to manufacture a laminate for laser printing with the specifications described below.

OP Varnish/Carbon Black Ink/White Ink/Aluminum Vapor Deposition Paper

(0022)

Embodiment 2

The laminate for laser printing was manufactured as specified below similarly to Embodiment 1, but with a different order of the coating sequence of the white ink and black ink used in said Embodiment 1.

OP Varnish/White Ink/Carbon Black Ink/Aluminum Deposition Paper

(0023)

Embodiment 3

A polyamide resin containing a yellow, brown, and indigo organic pigment was used as a vehicle instead of the carbon black ink of said Embodiment 2 with a black tone ink (manufactured by The InkTech K.K. Company). The laminate for laser printing was manufactured under conditions that were otherwise the same as in Embodiment 2 with the specification described below.

OP Varnish/White Ink/Black Tone Ink/Aluminum Vapor Deposition Paper

(0024)

Embodiment 4

A polyamide resin containing 12% of carbon black employed as a pigment was used as a vehicle on the aluminum vapor deposition surface of an aluminum vapor deposition paper (made by the Honshu Seishi K.K. Company) with black ink IBL-991 (made by The InkTech K.K. Company), and a polyamide resin containing 6% of the leafing type of aluminum paste having a particle diameter of 6 μm, used as a pigment, was used as a vehicle with a silver ink (manufactured by The InkTech K.K. Company), in this order. Coating was performed with a thickness of 3 μm, respectively, with the gravure printing method. In addition, OP varnish containing 18% of nitrocellulose was also used. After coating was applied with to the thickness of about 1 μm with the gravure printing method, a laminate for laser print having the specifications below was manufactured.

OP Varnish/Silver Ink/Carbon Black Ink/Aluminum Vapor Deposition Paper

(0025)

Embodiment 5

A polyamide resin containing a yellow, brown, and indigo organic pigment was employed as a vehicle instead of the carbon black ink that was used in said Embodiment 4 with the black tone ink (made by The TechInk K.K. Company). A laminate for laser printing having the specifications described below was then manufactured under conditions were otherwise the same as in said Embodiment 4.

OP Varnish/Silver Ink/Black Tone Ink/Aluminum Vapor Deposition Paper

(0026)

Embodiment 6

The polyimide resin used in said Embodiment 4 and Embodiment 5 was used as a vehicle on an aluminum vapor deposition surface of an aluminum vapor deposition paper (made by the Honshu Seishi K.K. Company) with a black tone ink, a polyamide resin having carbon black as a pigment was used as a vehicle with black ink IBL, and a polyamide resin was employed as a vehicle with a silver ink (manufactured by The InkTech K.K. Company, same as above), in this order. Printing was performed with the gravure printing method and coating was performed with a thickness of about 3 μm, respectively. OP varnish containing 18% of nitrocellulose was used on top of that, in the same way as in said Embodiment 1. Printing was conducted with the gravure printing method, coating was performed with a thickness of about 1 μm, and the laminated for laser printing was manufactured according to the specifications below.

OP Varnish/Silver Ink/Carbon Black Ink/Black Tone Ink/Aluminum Vapor Deposition Paper

(0027)

Embodiment 7

A polyamide resin was used as a vehicle with brown ink IBL-12 (manufactured by The InkTech K.K. Company) instead of the black tone ink of said Embodiment 6, with the same method as that of said Embodiment 6, and a laminate for laser printing was manufactured with the specifications below.

OP Varnish/Silver Ink/Carbon Black Ink/Brown Ink/Aluminum Vapor Deposition Paper

(0028)

Comparative Example 1

A polyimide resin containing 12% of carbon black employed as a pigment was used as a vehicle on an aluminum vapor deposition surface of an aluminum vapor deposition paper (made by the Honshu Seishi K.K. Company) with black ink IBL-991 (manufactured by The InkTech K.K. Company), printing was conducted with the gravure printing method and coating was applied with a thickness of about 3μm. An OP varnish containing 18% of nitrocellulose was used on top of that, printing was conducted with the gravure printing method, and coating was performed with a thickness of about 1 μm to manufacture a laminate for laser printing with the specifications below.

OP Varnish/Carbon Black Ink/Aluminum Vapor Deposition Paper

(0029)

Comparative Example 2

The leuco type of laser coloring ink (manufactured by the Dai Nippon Ink & Chemicals Co., Inc.) was used on an aluminum vapor deposition surface of an aluminum vapor deposition paper (manufactured by the Honshu Seishi K.K. Company). Printing was conducted with the gravure printing method and coating was applied with a thickness of about 3 μm. An OP varnish containing 18% of nitrocellulose was used on top of that, printing was conducted with the gravure printing method, coating was applied with a thickness of about 1 μm, and a laminate for laser printing were manufactured with the specifications below.

OP Varnish/Laser Coloring Ink/Aluminum Vapor Deposition Paper

(0030)

Test Example

The laminates for laser printing that were manufactured in said Embodiments 1 ~ 7 and Comparative Examples 1 ~ 2 were tested in evaluation tests with the results shown below in Table 1.

1. Print Test

The TEA type of carbon dioxide gas laser, and LASERMARK-920 (manufactured by the Canadian Lumonix Company) were used for irradiation from the OP varnish surface of the laminates for laser printing manufactured in said Embodiments 1 ~ 7 and Comparative Examples 1 ~ 2, with an irradiation energy of 0.8 J/cm^2 through a metal mask for 1 shot irradiation marking, and the characteristics of the appearance of the letters in these irradiation sample were ascertained visually.

2. Bottle Resistant Coating Test

Coating with a coating agent of the silicon was applied to the print samples processed by marking and the resulting status was then observed after 30 minutes.

3. Weather Resistance Test

Xenon weather meter (made by the Zuka Testing Devices K.K. Company) was used with an output of visible rays of 320 W/m^2, and irradiation with ultraviolet rays was conducted for a period of 24 hours.

(0031)

(Table 1)

	Print Test	Bottle Resistant Coating Test	Weather Resistance Test
Embodiment 1	Δ	◎	◎
Embodiment 2	Δ	Δ	◎
Embodiment 3	Δ	Δ	◎
Embodiment 4	◎	○	◎
Embodiment 5	◎	○	◎
Embodiment 6	◎	◎	◎
Embodiment 7	◎	◎	◎
Comp. Ex. 1	x	◎	◎
Comp. Ex. 2	○	x	x

(0032)

The symbols shown in Table 1 above have the following meaning:

1. Print Test

◎: highly recognizable characteristics, very good quality
○: good quality
Δ: recognizable
x: unrecognizable

2. Bottle Resistant Coating Test

◎: not affected at all
○: hardly affected at all
Δ: partially affected, texture under aluminum exposed
x: completely affected, the texture under aluminum exposed

3. Weather Resistance Characteristics

◎: no changes, the same status as before the irradiation
x: both the part with the print and the part without the print were yellowed and discoloration occurred in both parts, the print was partially dissolved and lost.

(0033)

As one can clearly see from Table 1 above, the laminates for laser printing relating to this invention display excellent coloring characteristics, and it was also determined that they had excellent bottle resistant coating agent characteristics and weather resistance. The laminates for laser printing of Embodiments 4 ~ 7 had particularly superior coloring characteristics, and laminates in Embodiments 6 ~ 7 were particularly suitable with a superior bottle resistant coating agent. On the other hand, while the laminate for laser printing of Comparative Example 1 had excellent characteristics of the bottle resistant coating agent as well as weather resistance characteristics, its coloring characteristics were particularly poor, so that it was not possible to obtain optimal printing recognition characteristics with an emission strength of 0.8 J/cm^2. In addition, although the laminate for laser printing relating to Comparative Example 2 had optimal coloring characteristics of the thermosensitive coloring type of ink, dissipation and fallout of the print due to the bottle resistant coating agent were confirmed. Moreover, flaws ranging from yellowing to discoloration were also confirmed both in the non-printed and in the printed part, as was partial dissipation.

(0034)

(Effect of the Invention)

As was explained above, because according to the present invention, on the surface of base material are created at least a foundation layer, a masking layer that can be decomposed and removed when laser light is absorbed and heat is generated, a layer provided with a different color and having a different brightness level which can be easily determined visually, and a combination of layers including for example a white ink layer and a black ink layer, or a black ink layer and a silver ink layer, the output of laser rays from this surface is adjusted and irradiation is applied so as to remove the mask layer in the form of a pattern such as a letter pattern. This makes it possible to achieve a clear and distinct print contrasting the color of the foundation layer to the color of the masking layer. In addition, because the foundation layer is left on the surface of the base material to protect the base material, laser print recording can be performed with excellent resistance characteristics of both the print part and of the base material.

(Brief Explanation of Figures)

(Figure 1)

A cross-sectional view of the layer construction in a first example of the laminate for laser printing according to this invention.

(Figure 2)

A cross-sectional view of the layer construction in a second example of the laminate for laser printing according to this invention.

(Figure 3)

A cross-sectional view of the layer construction in a concrete example of a laminate for laser printing according to this invention.

(Figure 4)

A cross-sectional view showing the layer construction in another concrete example of the laminate for laser printing according to this invention.

(Figure 5)

A cross-sectional view showing the layer construction in the printed mode of a laser print using the laminate for laser printing according to this invention.

(Explanation of Symbols)

1 base material
2 foundation layer
3 masking layer
4 OP layer

(Figure 1)

(Figure 2)

(Figure 3)

(Figure 4)

(Figure 5)

Continuation from the front page:

(72) Inventor: Masahiro SHIMOYAMADA
c/o Dainippon Printing Co., Ltd.
Tokyo-to, Shinjuku-ku, Ichigaya, Kaga-cho, Itchome, 1-ban, 1-go,

[Translator's Note]

Although the title was translated in the supplied English summary of JP 9-123606 as "Laser-marking laminated structure and laser marked laminated structure", the actual Japanese title is identical to the title of JP 9-123607 ("Laminate for laser printing and print thereof). I think that the translation of the title in the supplied summary of JP 9-123607 is much more logical, which is why I used it. The other title translation is not impossible, but it is certainly unusual. In any case, the Japanese title was identical in both cases ("Rehzah injiyoh sekisotai oyobi sono injitai") and the only difference between the two applications was in the claims.

Also, although the first name of the one of the inventors is translated differently (Atsuya OZAWA or Mitsunari OZAWA) in these two summaries, it is the same inventor. Because characters used in Japanese names can be pronounced in a number of ways, I have chosen again the alternative that appears to be more logical as it is used more frequently.

Steve Vitek, technical translator
PatentTranslators.com

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-216396

(43)Date of publication of application : 02.08.2002

(51)Int.Cl. G11B 7/24
B41M 5/36
G11B 7/0045
G11B 7/26
G11B 23/40

(21)Application number : 2001-010268

(22)Date of filing : 18.01.2001

(71)Applicant : RICOH CO LTD

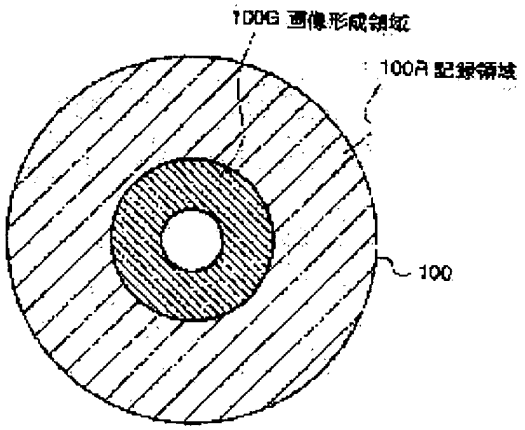
(72)Inventor : MATSUI HIDEAKI

(54) PLATE-LIKE RECORDING MEDIUM AND PRINTING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a plate-like information recording medium to whose same surface printing can be made with an optical reproducing device or an optical recording device.

SOLUTION: A recording area and an image-recording area are provided on the same surface as the recording surface of the plate-like information recording medium, and the information such as a disk name, a file name and the like is formed (printed) in an image-forming area 100G provided on the same surface as the recording area by irradiating a laser beam to the image-forming area. The image-forming area 100G can be a pigment, a substance which shows visible chemical reaction by the irradiation of the laser beam, whatever it may be fused or carbonized, or the like.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]